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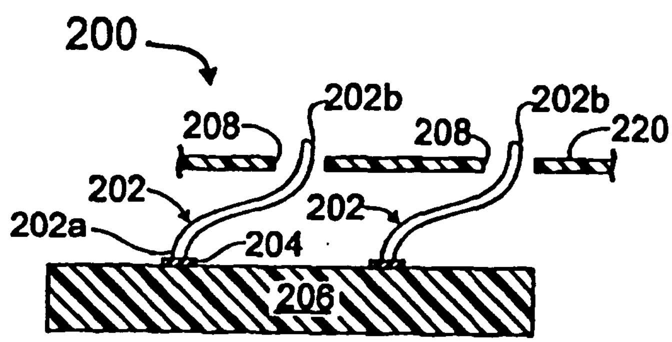
(54) Title: FLOATING LATERAL SUPPORT FOR ENDS OF ELONGATE INTERCONNECTION ELEMENTS

(57) Abstract



Ends (202b) of elongate interconnection elements, such as spring contact elements (202), effecting pressure connections to terminals of electronic components such as semiconductor devices resident on a semiconductor wafer are protected from adverse effects of undesired lateral forces by a "floating" lateral support element (220). The floating lateral support (220) is a planar member which has a plurality of holes (208) through which the free ends (202b) of the elongate interconnection elements (202) extend, and permits a small (constrained) amount of independent lateral deflection for each interconnection element (202). When an individual interconnection element (212a) exceeds the permitted amount of lateral deflection, it "bumps" into the sidewall of the respective hole in the floating lateral support (220) through which it extends, and further lateral deflection of the interconnection element is resisted by the floating lateral support (220) moving laterally with the laterally-deflected interconnection element (212a) and coming into contact with the remaining interconnection elements (212b, 212c, 212d), which will restrain further lateral movement of the laterally-deflected interconnection element (212a). Additional lateral displacement is prevented by a separate stop mechanism (330) located peripheral to the floating lateral support (320).

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FLOATING LATERAL SUPPORT FOR ENDS OF ELONGATE INTERCONNECTION ELEMENTS

TECHNICAL FIELD OF THE INVENTION

The present invention relates to interconnection elements for connecting to microelectronic components and, more particularly to interconnection elements which are elongate and which have free ends for making a connection with terminals of the microelectronic components.

CROSS-REFERENCE TO RELATED APPLICATIONS

This patent application is a continuation-in-part of commonly-owned, copending U.S. Provisional Patent Application No. **60/021,667** filed 05 Jul 96 by Eldridge, Khandros, Mathieu and Taylor, and its counterpart **08/824,988** filed 27 Mar 97.

This patent application is also a continuation-in-part of the following commonly-owned, copending U.S. (08/ or 60/) and PCT (PCT/) Patent Application Nos.:

08/452,255 (hereinafter "PARENT CASE") filed 26 May 95 and its counterpart **PCT/US95/14909** filed 13 NOV 95, both of which are continuations-in-part of **08/340,144** filed 15 Nov 94 and its counterpart **PCT/US94/13373** filed 16 Nov 94, both of which are continuations-in-part of **08/152,812** filed 16 Nov 93 (now **USP 5,476,211**, 19 Dec 95);

08/526,246 filed 21 Sep 95 and its counterpart **PCT/US95/14843** filed 13 Nov 95;

08/533,584 filed 18 Oct 95 and its counterpart **PCT/US95/14842** filed 13 Nov 95;

08/554,902 filed 09 Nov 95 and its counterpart **PCT/US95/14844** filed 13 Nov 95;

08/558,332 filed 15 Nov 95 and its counterpart **PCT/US95/14885** filed 15 Nov 95;

60/005,189 filed 17 May 96 and its counterpart **PCT/US96/08107** filed 24 May 96 and its counterpart **08/788,740** filed 24 Jan 97;

60/012,878 filed 05 Mar 96 and its counterpart **PCT/US96/08274** filed 28 May 96 and its counterpart **08/779,020** filed 10 Feb 97;

60/020,869 filed 27 Jun 96 and **60/024,405** filed 22 Aug 96 and their counterparts **08/819,464** filed 17 Mar 97 and **US97/08606** filed 15 MAY 97; and

all of which (except for the provisional patent application) are incorporated by reference herein.

BACKGROUND OF THE INVENTION

Generally, interconnections between electronic components can be classified into the two broad categories of "relatively permanent" and "readily demountable".

An example of a "relatively permanent" connection is a solder joint. Once two electronic components are soldered to one another, a process of unsoldering must be used to separate the components. A wire bond, such as between a semiconductor die and inner leads of a semiconductor package (or inner ends of leadframe fingers) is another example of a "relatively permanent" connection.

An example of a "readily demountable" connection is rigid pins of one electronic component being received by resilient socket elements of another electronic component.

Another type of readily demountable connection, more relevant to the present invention, is interconnection elements which themselves are resilient (springy) or are mounted in or on a springy medium. In many cases, these resilient interconnection elements (spring contact elements) are also elongate. An example of an elongate spring contact element is a tungsten needle of a probe card component. Such spring contact elements are intended to effect temporary pressure connections between a component (e.g., a printed circuit board) to which they are mounted (affixed) and terminals of another component, such as bond pads of a semiconductor device under test (DUT).

Generally, a certain minimum contact force is desired to effect reliable pressure contact to electronic components (e.g., to terminals on electronic components). For example, a contact (load) force of approximately 15 grams (including as little as 2 grams or less and as much as 150 grams or more, per contact)

may be desired to ensure that a reliable electrical pressure connection is made by a spring contact element to a terminal of an electronic component which may be contaminated with films on the surface of its terminals, or which has corrosion or oxidation products on its surface.

Generally, the making of repeated pressure connections with elongate spring contact elements will eventually lead to deformation of the spring contact element, thereby requiring the spring contact element(s) to be reworked or replaced.

Attention is directed to commonly-owned U.S. Patent Application No. 08/152,812 filed 16 Nov 93 (now USP 4,576,211, issued 19 Dec 95), and its counterpart commonly-owned copending "divisional" U.S. Patent Applications Nos. 08/457,479 filed 01 Jun 95 (status: pending) and 08/570,230 filed 11 Dec 95 (status: pending), all by KHANDROS, which disclose methods for making resilient interconnection elements (spring contact elements) for microelectronics applications involving: (i) mounting an end of an elongate core element (e.g., wire "stem" or "skeleton") to a terminal on an electronic component and severing the core element to be free-standing; (ii) imparting a desired spring shape to the free-standing core element; and (iii) coating the core element and adjacent surface of the terminal with a "shell" of one or more materials having a predetermined combination of thickness, yield strength and elastic modulus to ensure predetermined force-to-deflection characteristics of the resulting spring contacts. The resulting spring contact element is suitably used to effect pressure, or demountable, connections between two or more electronic components, including semiconductor devices.

Attention is directed to commonly-owned, copending U.S. Patent Application No. **08/340,144** filed 15 Nov 94 and its corresponding PCT Patent Application No. **PCT/US94/13373** filed

16 Nov 94 (WO95/14314, published 26 May 95), both by KHANDROS and MATHIEU, disclose a number of applications for the aforementioned spring contact elements, and also discloses techniques for fabricating contact pads (contact tip structures) having distinct metallurgy and topology at the free ends of the spring contact elements.

Attention is directed to commonly-owned, copending U.S. Patent Application No. **08/452,255** filed 26 May 95 and its corresponding PCT Patent Application No. **PCT/US95/14909** filed 13 Nov 95 (WO96/17278, published 06 Jun 96), both by ELDRIDGE, GRUBE, KHANDROS and MATHIEU, which discloses additional techniques and metallurgies for fabricating contact tip structures for joining to ends of existing interconnection elements.

Attention is also directed to commonly-owned, copending U.S. Provisional Patent Application No. **60/005,189** filed 17 May 96 and its corresponding PCT Patent Application No. **PCT/US96/08107** filed 24 May 96 (WO96/37332, published 28 Nov 96), both by ELDRIDGE, KHANDROS, and MATHIEU, which disclose techniques whereby a plurality of contact tip structures (see, e.g, #620 in Figure 6B therein) are joined to a corresponding plurality of elongate contact elements (see, e.g., #632 of Figure 6D therein) which are already mounted to an electronic component (#630).

Attention is also directed to commonly-owned, copending U.S. Patent Application No. **08/554,902** filed 09 Nov 95 and its corresponding PCT Patent Application No. **PCT/US95/14844** filed 13 Nov 95 (WO96/15458, published 23 May 96), both by ELDRIDGE, GRUBE, KHANDROS and MATHIEU, which disclose a probe card assembly which includes elongate resilient (spring) contact elements mounted to a "space transformer" component. As used herein, a space transformer is a multilayer interconnection

substrate having terminals disposed at a first pitch on a one surface thereof and having corresponding terminals disposed at a second pitch on an opposite surface thereof, and is used to effect "pitch-spreading" from the first pitch to the second pitch. In use, the free ends (tips) of the elongate spring contact elements make pressure connections with corresponding terminals on an electronic component being probed (e.g., tested).

As is described in one or more of the above-referenced patent applications, elongate resilient (spring) interconnect elements can suitably be used to make pressure connections to terminals of electronic components such as semiconductor devices. The contact force resulting from a pressure connection is generally longitudinal (reacted along the length of the elongate interconnection element).

As briefly discussed hereinabove, one problem with an array of elongate interconnection elements, particularly when the interconnection elements are spring contact elements employed to make repeated pressure connections to ("touchdowns" upon) a plurality of electronic components (such as would be of concern when the interconnection elements are being employed to probe a plurality of semiconductor devices resident on a semiconductor wafer) is damage, such as by lateral (versus longitudinal) forces acting upon one or more of the spring contact elements. Although each spring contact element has the ability to "survive" (react) a modest amount of lateral force, springing back to its original shape when the force is removed, when that modest amount of lateral force is exceeded, the spring contact element may permanently become deformed and damaged.

BRIEF DESCRIPTION OF THE INVENTION

It is therefore an object of the present invention to provide an improved assembly of elongate resilient interconnection elements.

It is another object of the present invention to provide a technique for preventing damage to the free (distal) ends of elongate interconnection elements and, more particularly to the ends of elongate spring contact elements.

According to the invention, a "floating lateral support" is a relatively rigid planar member having a plurality (e.g., four hundred) of holes through which the free ends of a corresponding plurality of elongate interconnection elements extend. This arrangement permits a small (constrained) amount of independent lateral deflection for each interconnection element. When an individual interconnection element exceeds the permitted amount of lateral deflection, it "bumps" into the sidewall of the respective hole in the floating lateral support through which it extends, and further lateral deflection of that interconnection element is resisted by the floating lateral support coming into contact with the remaining (e.g., three hundred ninety nine) interconnection elements. In this manner, further deformation of the laterally-deflected interconnection element is prevented.

The floating lateral support of the present invention is a planar member, is preferably substantially rigid, and is suitably made of an insulating material such as ceramic or polyimide (e.g., kapton-tm or upilex-tm), thermoplastic, liquid crystal polymer, or of conductive materials such as steel or molybdenum overcoated with an insulating material. Molybdenum is favored for applications where its coefficient of thermal expansion is relevant, such as in semiconductor applications.

The holes through the floating lateral support are preferably elongate, having a larger dimension in a direction wherein, in use, it is anticipated that the elongate interconnection elements extending through the holes in the floating lateral support will be subjected to lateral deflection. However, if a 'preferred' direction (orientation) cannot be ascertained, the holes through the lateral support may be circular (round). Typically, the cross-section of an elongate interconnection element is circular (round).

In an example of the present invention, the interconnection elements are elongate, have a length of <u>20-100 mils</u>, and have a diameter of <u>1-4 mils</u>; and the holes in the floating lateral support are <u>2-20 mils</u> larger in diameter than the diameter of the interconnection elements. If the holes through the floating lateral support are elongate rather than round, they suitably may be <u>2 mils</u> larger than the diameter of the interconnection element in a one direction, and <u>20 mils</u> larger than the diameter of the interconnection element in a second direction orthogonal to the first direction, the second direction being the direction in which it is expected that individual interconnection elements may be subjected to potentially-damaging lateral deflection.

According to an aspect of the invention, additional openings (holes) can be provided through the lateral support to permit access to the surface of the electronic component to which the elongate interconnection elements are mounted, such as for mounting discrete components to its surface with the lateral support in place.

Other objects, features and advantages of the invention will become apparent in light of the following description thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference will be made in detail to preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. The drawings are intended to be illustrative, not limiting.

Although the invention will be described in the context of these preferred embodiments, it should be understood that it is not intended to limit the spirit and scope of the invention to these particular embodiments.

Certain elements in selected ones of the drawings are illustrated not-to-scale, for illustrative clarity.

Often, similar elements throughout the drawings are referred to by similar references numerals. For example, the element 199 may be similar in many respects to the element 299 in another figure. Also, often, similar elements are referred to with similar numbers in a single drawing. For example, a plurality of elements 199 may be referred to as 199a, 199b, 199c, etc.

Figure 1A is a perspective view of an assembly of a plurality of elongate interconnection elements mounted to an electronic component.

Figure 1B is a side view of the electronic assembly illustrated in **Figure 1A**.

Figure 1C is a side view of the electronic assembly of **Figure 1A**, in use, making a number of touchdowns upon (pressure connections to) another electronic component.

Figure 2A is a side view, comparable to the side view of

Figure 1B, of an electronic assembly of the present invention.

Figure 2B is a top view of the electronic assembly of **Figure 2A**.

Figure 2C is a partial side view of an electronic assembly, comparable to that of **Figure 2A**, wherein the free ends of the elongate interconnection elements have contact tip structures joined thereto, according to an alternate embodiment of the present invention.

Figure 3 is a side view of an electronic assembly, comparable to that of **Figure 2A**, illustrating an additional component, according to an alternate embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1A is a perspective view of a portion of an electronic assembly 100 having a plurality (four of many shown) of elongate interconnection elements 102 extending from a like plurality of terminals 104 on a surface of an electronic component 106. For example, the electronic component may be the space transformer component of the probe card assembly described in the aforementioned **PCT/US95/14844**. For example, the elongate interconnection elements may be the composite interconnection elements of the aforementioned **PCT/US95/14909**. The present invention is not limited to this particular electronic component or to this particular elongate interconnection element. In most cases, however, the elongate interconnection elements will be resilient (spring) contact elements, such as are used to establish temporary pressure connections to terminals (not shown) of other electronic components.

Figure 1B is a side view of the electronic assembly 100 of **Figure 1A**, wherein it can best be seen that each elongate interconnection element 102 is affixed by its base end 102a to a corresponding terminal 104, and has a free end 102b distal from the base end.

Figure 1C illustrates the electronic assembly 100 in an exemplary use of making a sequence (series) of pressure connections to sets of terminals on another electronic component 110. This is exemplary of the electronic assembly 100 being a component of a probe card making a series of "touchdowns" on bond pads of semiconductor devices on a semiconductor wafer. As illustrated, in a first position of the assembly 100 (shown in dashed lines as 100a), representative of a single one of a sequence of touchdowns, the free ends (102b) of the elongate interconnection elements 102 contact a first set of terminals 112a on the semiconductor wafer 110, such as the bond pads of

a single die 110a on the semiconductor wafer 110. During the touchdown, the assembly 100 and the wafer 110 are brought together, resulting in longitudinal contact forces being reacted by the interconnection elements. The assembly 100 is then shifted to the right (as viewed) relative to the wafer 110 (or vice-versa) to make a subsequent touchdown.

In a second position of the assembly 100 (shown in dashed lines as 100b), representative of a subsequent touchdown, the free ends (102b) of the elongate interconnection elements 102 contact a second set of terminals 112b on the semiconductor wafer 110, such as the bond pads of another (e.g., adjacent) single die 110b on the semiconductor wafer 110. The assembly 100 is then shifted to the right (as viewed) relative to the wafer 110 (or vice-versa) to make a subsequent touchdown.

In a third position of the assembly 100 (shown in solid lines as 100c), representative of a subsequent touchdown, the free ends (102b) of a portion of the elongate interconnection elements 102 are off of the edge of the semiconductor wafer 100. This is indicative of a situation wherein the elongate interconnection elements 102 can be damaged by lateral (across the page, as viewed), a problem which is addressed by the present invention.

The lateral deflection situation includes the problem of the electronic assembly (100) or a portion thereof "stepping off" the edge of a semiconductor wafer.

According to the invention, means for protecting ends of elongate interconnection elements (102) from adverse effects of undesired lateral forces are provided in an electronic assembly (100).

Figure 2A is a side view, partially in cross-section, showing an assembly 200 (compare 100) of a floating lateral support element 220 in conjunction with a plurality (two of many shown) of elongate interconnection elements 202 (compare 102). The interconnection elements 202 each have two ends, a proximal end 202a (compare 102a) and a distal "free" end 202b (compare 102b), and may optionally be mounted at their proximal ends 202a to a substrate (e.g., to a terminal of an electronic component) 206 (compare 106). The distal ends 202b of the interconnection elements extend through respective holes 208 in a floating lateral support element 220. As illustrated, the ends 202b of the interconnection elements 202 protrude through the lateral support element 220 so that they can effect pressure connections to terminals of electronic components (compare **Figure 1C**).

Figure 2B is a top view of the assembly 200 of **Figure 2A**, showing a plurality (four of many) of elongate interconnection elements 212a, 212b, 212c and 212d (compare 202) extending through a corresponding plurality of holes 218a, 218b, 218c and 218d (compare 208) in the floating lateral support member 220.

The interconnection elements (102, 202) are typically resilient (spring) contact structures which may be either composite interconnection elements or monolithic interconnection elements, and are generally intended to make pressure connections to terminals (not shown) of electronic components (not shown). The general direction of the desired pressure connection force would be into the page as viewed in **Figure 2B** (i.e., along the length/longitude of the interconnection element), or vertically downward onto the ends (202b) of the interconnection elements as viewed in **Figure 2A**.

As mentioned above, the interconnection elements are intended to react longitudinal forces, and may become damaged if they are subjected to excessive transverse (lateral) forces.

As illustrated in **Figure 2B**, the interconnection element 212a has been subjected to a lateral force, thereby becoming displaced (to the left, as viewed in the figure) to the position shown in dashed lines. At this position, the interconnection element contacts the bore (sidewall) of the corresponding hole 218a. Such a lateral force may, as mentioned hereinabove, result from the entire plurality of interconnection elements being brought into contact with an electronic component (not shown, compare 110) having an edge, such as the edge of a semiconductor wafer. This would be likely to occur in the case of a multiple memory chip probe, where a portion of the probe would inevitably "step off" an edge of the wafer.

As is readily envisioned by the illustration of **Figure 2B**, further (additional) lateral force applied to the interconnection element 204a will commence to move the floating lateral support member 202, whereupon (after allowing for clearances) any significant further movement (to the left, as viewed in the figure) will be resisted by **all** the remaining interconnection elements 212b, 212c, 212d as they are contact by the sidewalls of the respective holes 218b, 218c, 218d in the support member 220 through which they extend.

In other words, when a lateral force is applied to a selected one or more of the interconnection elements, they behave as individuals, allowing the lateral support to move ("float") with the interconnection element (212a) being deflected laterally, until the lateral force reaches a threshold, at which position of the floating lateral support member (220) the plurality of interconnection elements behave as a group.

The lateral support member of the present invention thus helps prevent damage to elongate interconnection elements

resulting from lateral forces.

The floating lateral support member 220 is relatively rigid, made of any suitable insulating material such as ceramic or polyimide (e.g., kapton-tm or upilex-tm), thermoplastic, liquid crystal polymer, or of conductive materials such as steel or molybdenum overcoated with an insulating material. Molybdenum is favored for applications where its coefficient of thermal expansion is relevant, such as in semiconductor applications.

According to a feature of the invention, a plurality of contact tip structures are pre-fabricated on a sacrificial substrate and are joined to ends of a corresponding plurality of interconnection elements.

As shown in **Figure 2C**, a plurality of tip structures 230 can be joined (such as by brazing) to the distal (free) ends 202b of the interconnection elements 202 after the floating lateral support member 220 has been placed over the free ends. A fuller discussion of pre-fabricating tip structures for joining to ends of interconnection elements can be found in the aforementioned **PCT/US96/08107**.

The advantages of mounting pre-fabricated tip structures to the ends of interconnection elements (or vice-versa) include:

- the tip structures can be caused to have surface textures (e.g., surface roughness and shape) specifically adapted to the terminal metallurgy of the electronic component(s);
- the tip structures can have a metallurgy which is entirely dissimilar from that of the interconnection elements to which they are mounted;
- the tip structures can be accurately located with respect to one another, thereby relaxing constraints on the accurate relative position of the ends of the interconnection elements

to which they are joined; and

- the tip structures can be of a larger cross-dimension (e.g., diameter) than the interconnection elements to which they are joined.

Due to the shape of the illustrated elongate interconnection elements 202, the lateral support member 220 will be restrained from sliding down the length of the elongate interconnection elements 202. And, with a plurality of elongate interconnection elements 202, the lateral support member 220 will tend to stay in place. The contact tip structures 230 are preferably of a larger diameter than the holes (208) through the lateral support member 220 and would thus necessarily be joined to the free ends 202b of the elongate interconnection elements 202 after the floating lateral support component 220 is "installed" over the free ends 202b of the interconnection elements 202. In this manner, an additional advantage of the contact tip structures 230 is in preventing the floating lateral support component 220 from being removed from or from sliding off of the ends 202b of elongate interconnection elements 202.

It is within the scope of this invention that the interconnection elements may be composite interconnection elements or monolithic interconnection elements, including tungsten needles.

As also shown in **Figure 2C**, additional openings 240 (one of several shown) can be provided in the floating lateral support member 220 so that after the floating lateral support member is in place, additional discrete components such as resistors or capacitors (not shown) can be inserted through the floating lateral support member 220 and mounted (e.g., soldered) to terminals (not shown) onto the surface of the component (see 206, **Figure 2A**) to which the elongate interconnection elements 202 are mounted.

Figure 3 illustrates another embodiment of the invention wherein the assembly 300 includes a plurality (two of many shown) of elongate interconnection elements 302 (compare 202) extending from a surface of an electronic component 306 (compare 206), each having a free end 302b (compare 202b) extending through a corresponding hole 308 (compare 208) in a floating lateral support member 320 (compare 220). As mentioned above, when one interconnection element 302 is deflected laterally, eventually the floating lateral support 320 will engage the remaining interconnection elements 302 which will provide resistance against further lateral movement of elongate element 302 being laterally deflected. In extreme cases, however, the "mass" resistance against further lateral deflection provided by the remaining interconnection elements may be insufficient to prevent one or more of the interconnection elements from being damaged. To this end, the assembly 300 is provided with a mechanical rigid stop mechanism 330.

The stop mechanism 330 is suitably in the form of a square ring affixed to the top (as viewed in the figure) surface of the electronic component 306. The stop mechanism 330 has an inner dimension (ID) which is greater than the outer (peripheral) dimension of the floating lateral support 320, for example <u>20-50 mils</u> greater, resulting in a lateral gap 332 of controlled dimension between the edge (periphery) of the floating lateral support 320 and the stop mechanism 330. The stop mechanism is suitably made of a rigid insulating material, or may be a metallic ring which may or may not be insulated, and extends above the top surface of the component to a height which is less than the height of the interconnection elements 302, for example <u>10-25 mils</u> less so that the interconnection elements can compress longitudinally when the assembly 300 is being urged against another electronic component (compare **Figure 1C**).

For example, if a one of the two illustrated interconnection elements 302 were to become laterally-deflected, it would deflect laterally and engage the sidewall of the corresponding hole 308 through the lateral support member 320. Then, with continued lateral deflection force being applied, the remaining holes 308 in the lateral support member 320 would contact the remaining interconnection elements 302, which would resist (but not absolutely prevent) further lateral deflection of the support member and the interconnection element. Then, with continued lateral deflection force being applied, the lateral support member 320 would contact the stop mechanism 330 which would prevent any further lateral deflection. In other words, in this manner the remaining interconnection elements 302 resist lateral displacement of the floating lateral support 320, and the stop mechanism 330 prevents further (excessive) lateral displacement of the floating lateral support 320.

Although the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character -it being understood that only preferred embodiments have been shown and described, and that all changes and modifications that come within the spirit of the invention are desired to be protected. Undoubtedly, many other "variations" on the "themes" set forth hereinabove will occur to one having ordinary skill in the art to which the present invention most nearly pertains, and such variations are intended to be within the scope of the invention, as disclosed herein.

CLAIMS

What is claimed is:

1. An electronic assembly, comprising:

an electronic component having a surface;

a plurality of elongate interconnection elements extending from the surface of the component, each elongate interconnection element mounted by a base end to the surface of the electronic component and having a free end opposite the base end; and

a planar element having a plurality of holes therethrough, each hole corresponding to a one of the plurality of elongate interconnection elements and having a diameter larger than a diameter of the elongate interconnection elements, the free ends of the elongate interconnection elements extending through the holes in the planar element.

2. An electronic assembly, according to claim 1, wherein:

the planar element is a material selected from the group consisting of an insulating material such as ceramic or polyimide, thermoplastic, liquid crystal polymer, or of conductive materials such as steel or molybdenum overcoated with an insulating material.

3. An electronic assembly, according to claim 1, wherein:

the electronic component is a space transformer component of a probe card assembly.

4. An electronic assembly, according to claim 1, wherein:

the elongate interconnection elements are spring contact elements.

5. An electronic assembly, according to claim 1, wherein:

the elongate interconnection elements are tungsten

needles.

6. An electronic assembly, according to claim 1, wherein:

the elongate interconnection elements are composite interconnection elements.

7. An electronic assembly, according to claim 1, further comprising:

a mechanical stop disposed on the surface of the electronic component.

8. An electronic assembly, according to claim 1, further comprising:

a separate and distinct contact tip structure joined to the free end of each elongate interconnection element.

9. An electronic assembly, according to claim 1, further comprising:

at least one additional hole extending through the planar element.

10. A floating lateral support, adapted in use to protect ends of elongate interconnection elements for effecting pressure connections to terminals of electronic components, comprising:

a planar element having a plurality of holes therethrough, each of said holes sized and shaped to permit a free end of an elongate interconnection element to extend therethrough and to deflect laterally a prescribed distance prior to contacting a bore (sidewall) of the hole.

11. A floating lateral support, according to claim 10, wherein:

the planar element is a material selected from the group consisting of an insulating material such as ceramic or polyimide, thermoplastic, liquid crystal polymer, or of

conductive materials such as steel or molybdenum overcoated with an insulating material.

12. A floating lateral support, according to claim 10, wherein:

the elongate interconnection elements are spring contact elements.

13. A floating lateral support, according to claim 10, wherein:

the elongate interconnection elements are tungsten needles.

14. A floating lateral support, according to claim 10, wherein:

the elongate interconnection elements are composite interconnection elements.

15. Method of protecting ends of elongate interconnection elements from being damaged, comprising:

disposing a floating lateral support over the ends of the elongate interconnection elements, the ends of the elongate interconnection elements protruding through the floating lateral support for making pressure connections to terminals of electronic components.

16. Method, according to claim 15, wherein:

the elongate interconnection elements are mounted to a surface of a substrate; and

further comprising:

disposing a stop mechanism on the surface of the substrate to prevent excessive lateral displacement of the floating lateral support.

17. Method, according to claim 15, wherein:

the planar element is a material selected from the group consisting of an insulating material such as ceramic or polyimide, thermoplastic, liquid crystal polymer, or of conductive materials such as steel or molybdenum overcoated with an insulating material.

18. Method, according to claim 15, wherein:
the electronic component is a space transformer component of a probe card assembly.

19. Method, according to claim 15, wherein:
the elongate interconnection elements are selected from the group consisting of spring contact elements, tungsten needles, and composite interconnection elements.

20. Method, according to claim 15, further comprising:
disposing a mechanical stop on the surface of the electronic component.

Figure 1A

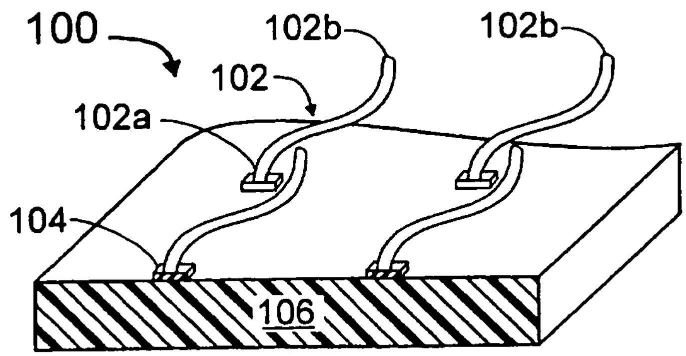


Figure 1B

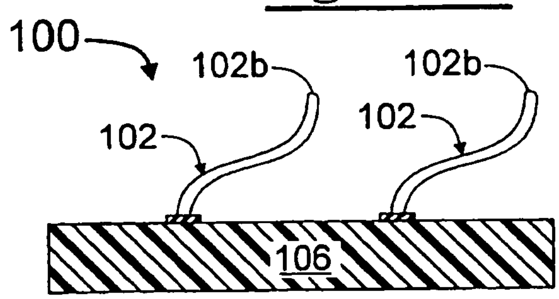
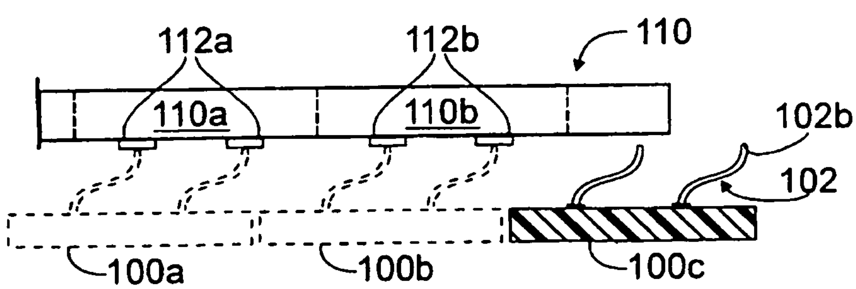


Figure 1C



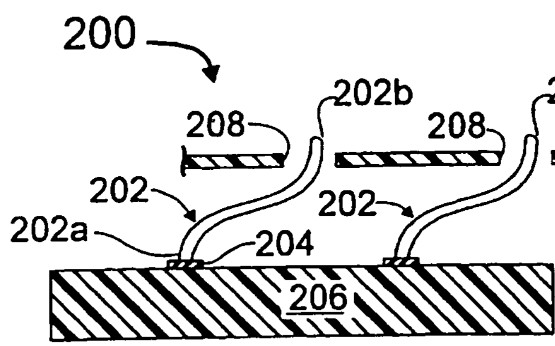


Figure 2A

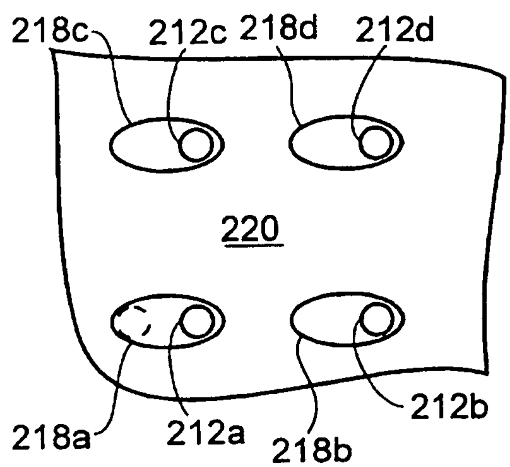


Figure 2B

Figure 2C

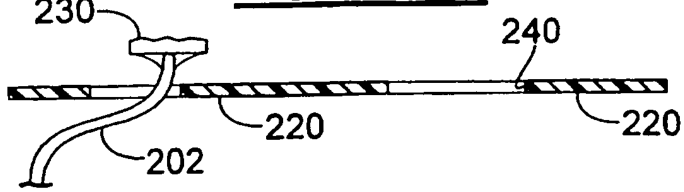


Figure 3